

# Physics with MVTX at sPHENIX

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► Communication:

- Discussion email list: <https://lists.bnl.gov/mailman/listinfo/sphenix-hf-jets-l>
- Wiki page under construction: [https://wiki.bnl.gov/sPHENIX/index.php/Heavy\\_Flavor\\_Topical\\_Group](https://wiki.bnl.gov/sPHENIX/index.php/Heavy_Flavor_Topical_Group)

► Meetings/Events

- Use weekly simulation meetings for updates, <https://indico.bnl.gov/categoryDisplay.py?categId=88>
- Goal oriented irregular events:
  - MVTX brainstorming meeting, Mar 8 / MAPS+HF-jet joint workfests, e.g. Jan 5-7 2017 @ Santa Fe / Pre-collaboration meeting work-fest on May 16-17, 2016 / Initial TG meeting on Apr 22 , 2016
- [Expect new workfest between BNL director review on MVTX and full proposal to DOE](#)

Workfest in the summer to address review comments, work towards full proposal



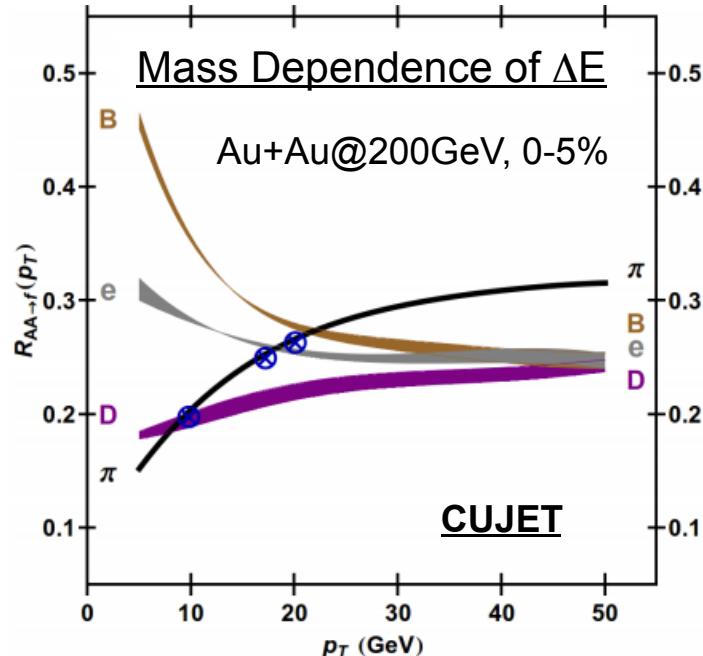
April 12, 2017

sPHENIX HF Topical Group Meeting

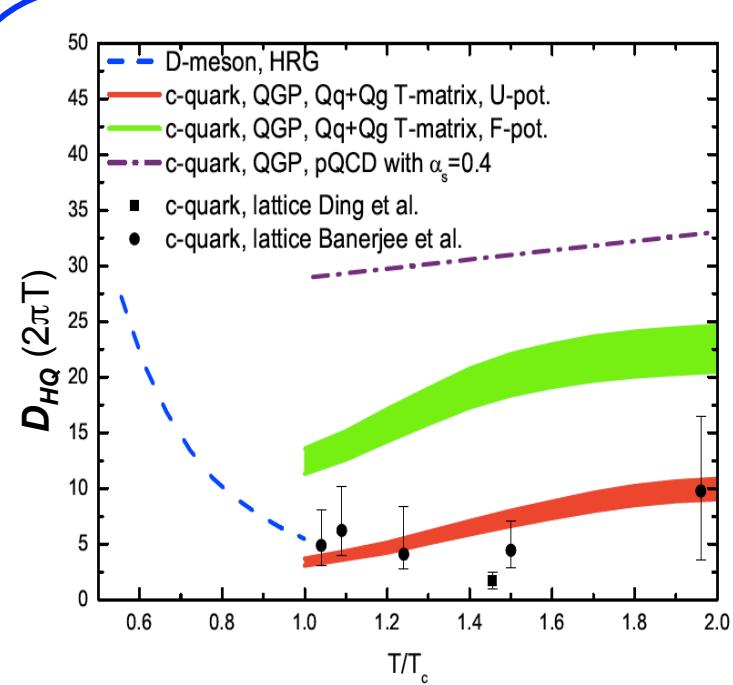
X. Dong

# Physics Goals of Heavy Flavor Measurements

- Mass/flavor dependence of parton energy loss
- Quantify the medium transport parameter – heavy quark diffusion coefficient, DHQ

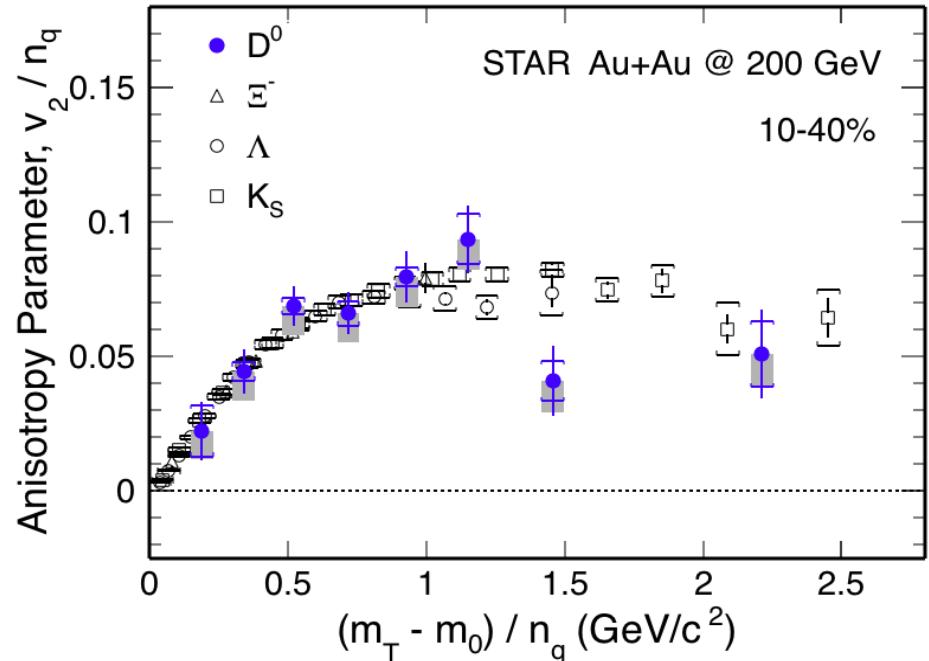
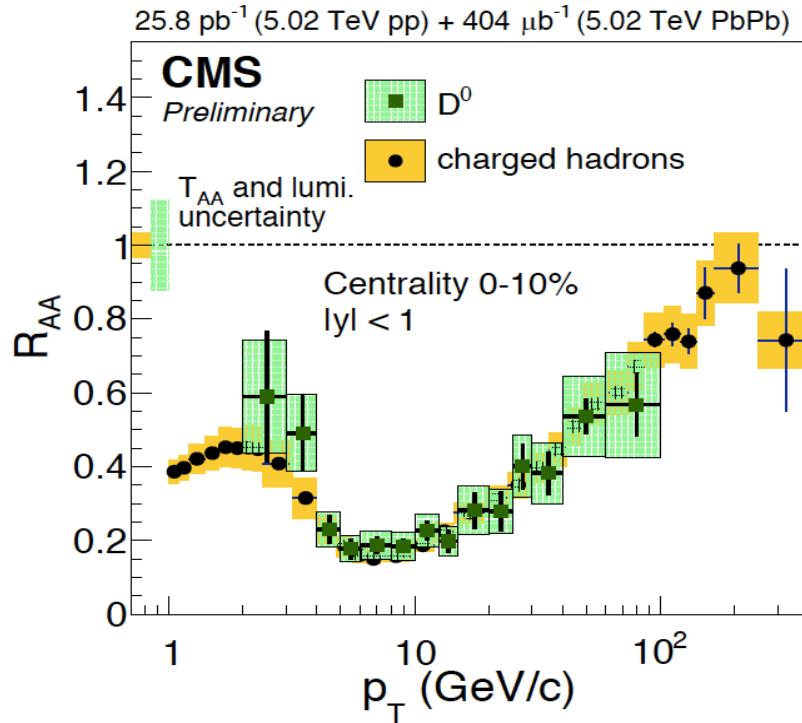


PRL 108 (2012) 022301



QCD white paper - arXiv: 1502.02730

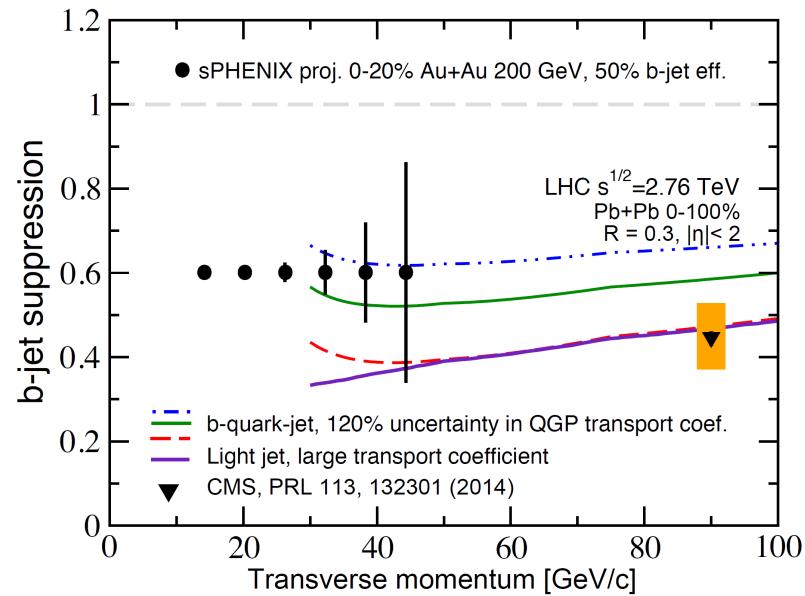
# Achievements and Next Step



Evidence of charm quark flow with QGP medium  
 -> charm quarks may be thermalized in the medium

**Open bottom** production over a wide range of momentum  
 Mass/Flavor dependence of parton energy loss  
 Cleanest probe to quantify medium transport properties – e.g.  $D_{HQ}$   
 Total bottom yield for precision interpretation of Upsilon suppression

# Money Plots for MVTX

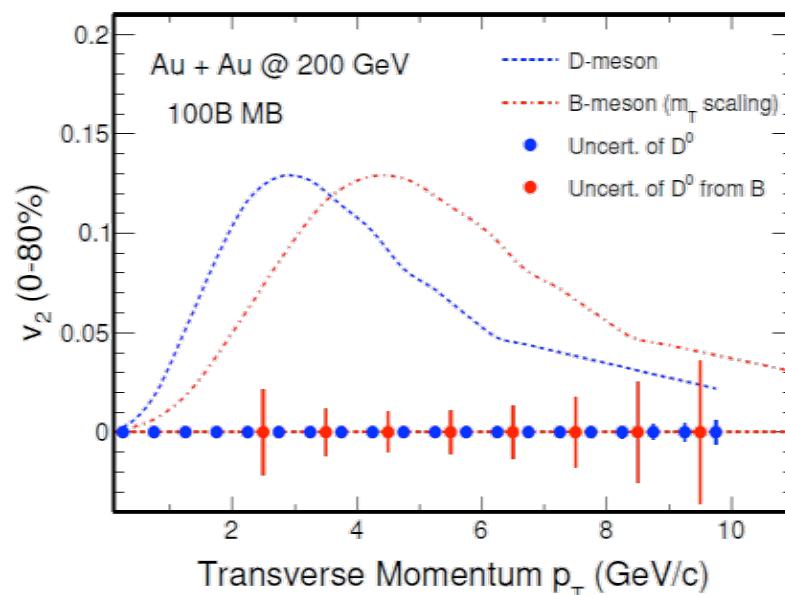
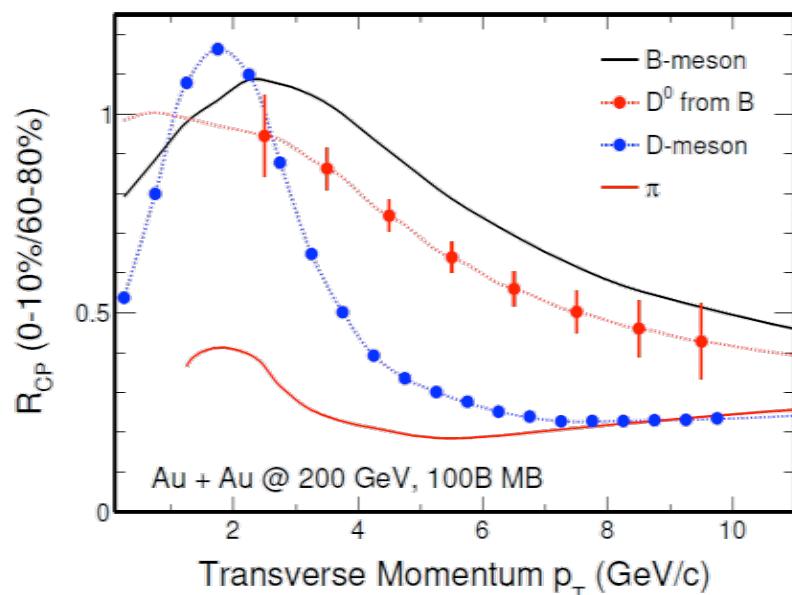


Open bottom production at midrapidity over a broad momentum region

- B-meson  $< 15 \text{ GeV}/c$
- b-jet  $> 15 \text{ GeV}/c$

vs. LHC

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Complementarity</li> <li>• Uniqueness</li> </ul> | <ul style="list-style-type: none"> <li>- different QGP media</li> <li>- less gluon splitting</li> </ul> |
|---|---|



# Near Terms Plan

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Jin, sPHENIX general meeting 3/31

- ▶ Update non-prompt D meson performance projection
  - **Deliverable by end Apr**: update the Rcp and v2 plot with more realistic simulations for MB and peripheral collisions - Xin D., Xiaolong C.
- ▶ Explore complimentary B-hadron channels beyond non-prompt-D
  - **By summer**: Fast simulation for exclusive channels, B->J/Psi K, B->D pi - Xin D., Xiaolong C.
  - **By summer, help needed**: B->non-prompt J/Psi->e<sup>+</sup>/e<sup>-</sup> and p+p triggering
- ▶ Inclusive b-jet  $R_{AA}$ 
  - **By Apr (?)**: Update theory curve to RHIC energy – Cesar da S. working with Vitev group
  - **Deliverable by end Apr**: Update theory curve for RHIC energy for  $R_{AA}$  plot
- ▶ di-b-jet asymmetry
  - **By Apr (on-going)**: Extract di-jet purity from Geant4 simulation - Haiwang Y.
  - **Deliverable by end Apr**: Apply di-jet purity to projection – Darren M., Haiwang Y.
- ▶ b-jet-non-prompt-D asymmetry:
  - **Deliverable by end Apr (recently updated)**: Produce uncertainty projection in fast simulation – Xuan L.

Review likely to be in June-July  
Update the full simulation with the INTT material fix?

# MVTX proposal TODO

## Technical performances:

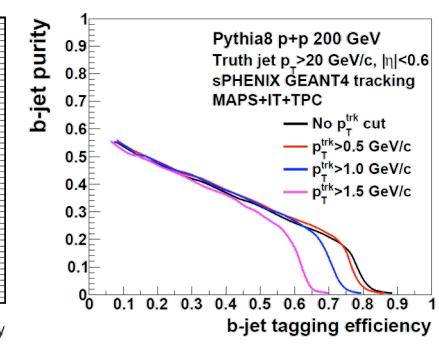
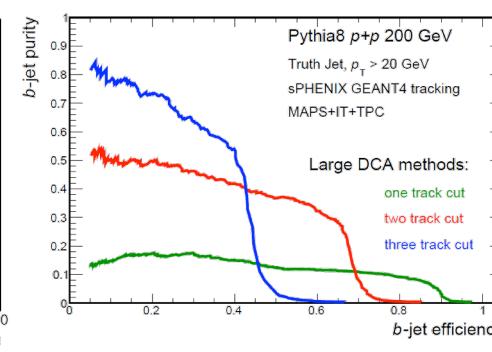
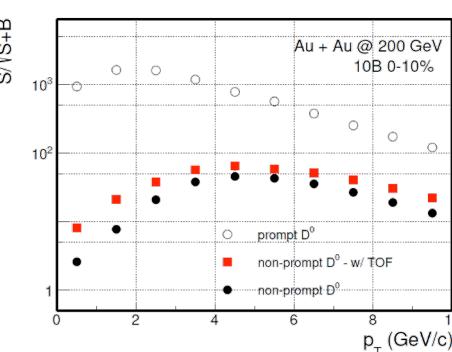
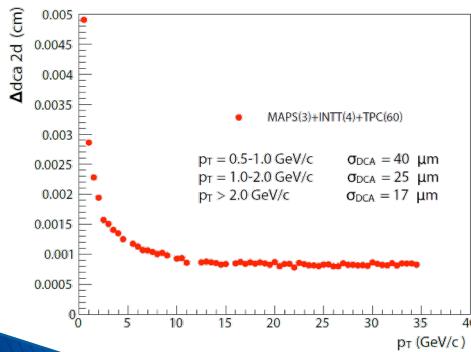
### ► Realistic implementation in Geant4



- **Completed:** implement ladder structure in simulation – Tony F., Gaku M.
- **Completed :** digitization of MAPS detector - Tony F.
- **By end Apr:** Update tracking performance plots for MAPS, DCA and dp/p resolutions - Tony F.
- **By summer (?)**: complete the pile-up simulation framework – Mike M., Yorito Y.

### ► *b*-jet tagging algorithm

- **By summer, help needed :** Investigating full-detector fast simulation for *b*-jet simulation. Look into general packages e.g. DELPHES.
- **By summer:** Full calorimetry simulation with secondary vertexing tagger – Sanghoon L.
- **By summer:** Full calorimetry simulation with high-DCA track counting – Haiwang Y.
- It will be very useful to use new in-development pattern recognition software to bring back hit collection efficiency.



Jin & Xin

sPHENIX General Meeting